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TO MORRIS HALLE

whose inspiration awakened our interest in phonology

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A Reformulation of Grimm's Law

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Grimm's Law expresses the principal sound changes in the Indo-European (IE) stop consonant system that differentiated Germanic from other branches of the IE language family.

IE is generally considered to have possessed three series of stop consonants: voiceless, lax voiced, and tense voiced:

p	b	bh
t	d	dh
k	g	gh
k ^w	g ^w	gh ^w

The Germanic counterparts to the *p*-series are voiceless continuants;¹ the counterparts to the *b*-series are voiceless stops; and the counterparts to the *bh*-series are voiced continuants between vowels and voiced stops initially. Thus, Grimm's Law is usually written in three parts:

- G1. p → ph
- G2. b → p
- G3. ph → f and bh → v

The change of initial *v* to *b* in Germanic I assume to be a subsequent development. For brevity, the changes have been written only for the labials. In terms of distinctive features, G1, G2, and G3 are written as follows:

¹By Verner's Law, these became voiced in certain contexts, but this change is of no concern here.

- G1. [-sonorant, -voice] → [+tense]
 G2. [-sonorant, -tense] → [-voice]
 G3. [-sonorant, +tense] → [+continuant]

We will not be concerned with G3 in this paper or with any of the details of its formulation. In the history of Germanic, G3 may have preceded G2, but this possibility has no bearing on the topics in this paper.

There has been much controversy among linguists about whether G1 and G2 were in some sense "one" linguistic event, or whether they were completely separate historical changes. The former claim, for example, is argued in J. Fourquet's *Les mutations consonantiques du germanique*. Any of the arguments in the present paper are valid, whatever the truth of Fourquet's claim. For purposes of explicitness, I will regard the separate statements of G1 and G2 above as the correct, accepted formulation of Grimm's Law. If I were to start from a basis that incorporated the two rules into one, some of my arguments would require more complicated formulation, which would only render them harder to understand without any compensation in insight or accuracy.

G1 and G2 represent events in our reconstruction of IE history that are not parts of other known events in this history; even if G1 and G2 are one event, it is a complex one, and to isolate it from other IE phenomena is not a desirable analysis.

Therefore, let us consider G1 and G2 to have operated historically in the "reverse" direction. That is, assume that the traditional output to G1 and G2 is actually the original system of the IE obstruents. Thus, Proto-Germanic (minus the effect of G3) would actually represent the most ancient, "pure" form of Indo-European. Let us call this "New Indo-European" (NIE) as opposed to "Traditional Indo-European" (TIE).

TIE:	p	b	bh	NIE:	ph	p	bh
	t	d	dh		th	t	dh
	k	g	gh		kh	k	gh
	k ^w	g ^w	gh ^w		kh ^w	k ^w	gh ^w

It goes without saying that no specific claim about the phonetic nature of the "tense" feature of the IE stops can be made.

The reverses of G1 and G2 (call them Z1 and Z2) would then operate in all those dialects or branches of IE in which Grimm's Law has been said not to operate.

- Z1. $p \rightarrow b$
 Z2. $ph \rightarrow p$

We will see in this paper how at least Z2 can be related to other known historical processes in IE, in a way that G1 and G2 are not in the traditional analysis of the history of IE. Hence, the total number of historical "events" in my reconstruction of language history can be reduced. (One cannot, however, characterize what constitutes a historical linguistic event in any complete way; for example, one cannot claim that the only historical phonological events are the additions of single rules to grammars; the addition of several related rules at successive intervals may be causally connected and be part of one "event.")

It has often been remarked that the TIE analysis is weak because the reconstructed stop system is intrinsically of doubtful validity. Any quick inventory of stop systems in existing natural languages throws doubt on whether the TIE stop system is even possible in natural language. As Jakobson has observed: "To my knowledge, no language adds to the pair /t/ - /d/ a voiced aspirate /dh/ without having its voiceless counterpart /th/ . . . ; therefore theories operating with the three phonemes /t/ - /d/ - /dh/ in Proto-Indo-European must reconsider the question of their phonemic essence."²

This remark cannot be taken as support for the NIE stop system, since the unmarked system that Jakobson and many others would consider more credible than TIE would be *p*, *b*, and *ph*. Although NIE avoids having two series of voiced stops with only one voiceless, it has two tense series and only one lax. The heart of the dilemma is that as long as one considers the *bh*-series to be motivated in IE (because of Indic *bh*, Greek *ph*, Iranian *b*, Germanic *v* and *b*, and Armenian *b*), one must postulate a three-series stop system with voiced aspirates. Such a system would be a rare phenomenon, no matter what the other two series are. Given that two of the

²Roman Jakobson, "Typological Studies and Their Contribution to Historical Comparative Linguistics," in *Selected Writings*, vol. I, p. 532.

series are *p* and *bh*, the only relevant question for the analysis presented in this paper is the following: Is a language with *ph* or a language with *b* more natural? Without struggling with this rather abstract question, let us turn to some other arguments that support the NIE rather than the TIE analysis.

(1) The Iranian, Slavic, Baltic, Celtic, and Latin branches of IE exhibit the following development. For convenience, these branches will be referred to as the "central group" (CG).

TIE	<i>p</i>	<i>b</i>	<i>bh</i>
NIE	<i>ph</i>	<i>p</i>	<i>bh</i>
CG	<i>p</i>	<i>b</i>	<i>b</i>

(Actually, in Latin, *bh*, *dh*, *gh*, and *gh^w* became *b*, *d*, *h*, and *w*, and only between vowels was the development this simple.) In the TIE analysis, the two processes G1 and G2 are formally equivalent to the two processes Z1 and Z2 in the NIE analysis. Despite this equivalence, the traditional analysis must postulate a separate historical event to differentiate the central group from Greek and Indic:

CG. [-sonorant] → [-tense]

But compare CG to the formulation of Z1 and Z2 in distinctive features:

- Z1. [-sonorant, -tense] → [+voice]
 Z2. [-sonorant, -voice] → [-tense]

In the new analysis, the historical change CG is clearly not isolated from Z2, as it is in the traditional analysis, where the counterpart of Z2 (G1) and CG operate in different language groups. Rather, CG is a *generalization* of Z2 in an obvious sense (dropping a feature in the rule widens its applicability) and is part of the same historical event. Thus, Greek, Indic, and the central group all underwent Z1 and Z2, but Z2 was simplified in the central group and generalized to rule CG. Since the NIE analysis allows us to relate Z2 to another process in IE, namely CG, in a way that G1 could not, we have an important reason for preferring it to the TIE analysis.

(2) The unique reflexes of the IE stop system in Hittite provide further evidence for the NIE analysis.³

TIE	t	d	dh
NIE	th	t	dh
Hittite	t	t	d

It is fairly obvious that two rules are needed to derive the Hittite stops from TIE, the second of which is CG, as in section (1).

H.	[-sonorant, -tense] → [-voice]
CG.	[-sonorant] → [-tense]

The operation of CG in Hittite and the central group was probably one event.

However, if we take NIE as the primitive stop system, H can be dispensed with entirely. CG explains the developments perfectly and, incidentally, applies now to two series of IE stops rather than, in somewhat ad hoc fashion, just to one. Thus, in the general picture furnished by NIE, Hittite differed from the central group only in that it did not undergo Z1.

(3) Compare the Germanic and Armenian obstruents that result from IE stops to the TIE and NIE systems. (Dentals will be used in this chart, since *ph* subsequently became *h* in Armenian.)

TIE	t	d	dh
NIE	th	t	dh
Germanic	θ	t	ð-d
Armenian	th	t	d

In the first place, although Armenian is similar to Germanic, it clearly did not undergo G3. Rather, the tense, voiced stops were simply laxed:

A.	[-sonorant, +voice] → [-tense]
----	--------------------------------

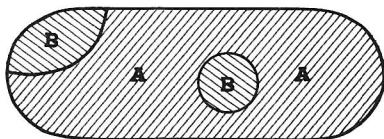
This rule must apply, whether one accepts the NIE or the TIE analysis. In either case, it can be related to the rule CG; one could imagine that, when CG was operative in the Iranian branch of IE, a restricted version of it was borrowed into

³Antoine Meillet, *Introduction à l'étude comparative des langues indo-européennes*, p. 84. The details are in the third paragraph.

Armenian. But this possibility has no bearing on choosing between NIE and TIE.

More important, the TIE analysis must suppose that Armenian also underwent G1 and G2. In particular, it must suppose that G1 and G2 applied independently to Germanic and to Armenian, because the Germanic and Armenian areas are geographically distant and because the two languages do not regularly share the same linguistic characteristics. For example, Armenian is in the *satem* group and Germanic is not; the development of *s* differs in the two, as does the development of the vowels; the accent is fronted in Germanic but not in Armenian; and so forth. If there is a verified principle of dialect geography, it is that, when faced with dialect maps containing isolated relic areas, one assumes that these areas exhibit the older situation in the language.⁴ An exception might occur if there was evidence that the speakers in the two areas had at one time been in one linguistic community vis-à-vis the larger group; such evidence would be the sharing of several independent language characteristics.

Since this condition is not fulfilled for the isolated Armenian-Germanic areas, the TIE analysis grossly and arbitrarily violates this dialect geography principle by treating the A area as primitive and the B area as innovative, as is shown in the diagram below.



With the same reasoning, the two rules in the TIE analysis, H, necessary for Hittite, and G2, necessary for Germanic and Armenian, are identical, and no explanation other than accident can be given for this fact. Thus, the principle of dialect geography gives us further reasons for preferring the NIE analysis, in which Z1 and Z2 operate on almost all of Indo-European.

(4) Consider next the development of Greek and Indic from

⁴See, for example, the diagrams in Leonard Bloomfield's *Language*, pp. 333, 334, 336.

NIE. As is well known, Greek also requires a rule devoicing the voiced aspirates that appear in Sanskrit.

DV. $[-\text{sonorant}, +\text{tense}] \rightarrow [-\text{voice}]$

DV yields three stages of development from NIE to Greek:

NIE	ph	p	bh	
Z1: $p \rightarrow b$	ph	b	bh	(This rule applies in Indic, Greek, and the central group.)
Z2: $ph \rightarrow p$	p	b	bh	(This is the Indic system; the central group goes further by means of CG, as discussed above.)
DV: $bh \rightarrow ph$	p	b	ph	(This is the Greek system; both NIE and TIE analyses need DV.)

Another well-known development in Greek and Indic was the laxing of stops directly before other obstruents or before another tense obstruent in the root (but not in a suffix). Examples follow:⁵

Greek:		
thi - thē - mi	\rightarrow	tithēmi
the - throph - a	\rightarrow	tetropha
Sanskrit:		
dha - dhā - mi	\rightarrow	dadhāmi
bho - bhudh - ye	\rightarrow	bobudhye
Greek:		
gluph - s - ō	\rightarrow	glupsō
e - threph - thēn	\rightarrow	ethrepthēn
Sanskrit:		
labh - sya - te	\rightarrow	labsyate
dhugh - dhve	\rightarrow	dhugdhve
		(lapsyate)

Kiparsky, referring to the first of these as cluster reduction (CR) and to the second as Grassmann's Law (GL), has formulated this rule as follows: (I am substituting $[-\text{sonorant}]$ for $[-\text{vocalic}]$.)

$$\begin{array}{l} \text{CR.} \\ \text{GL.} \end{array} \quad [-\text{sonorant}] \rightarrow [-\text{tense}] / \left\{ \begin{array}{l} \text{s, dh, \#} \\ \text{[+cont]}_0 \end{array} \left[\begin{array}{l} -\text{sonorant} \\ +\text{tense} \\ +\text{root} \end{array} \right] \right\}$$

⁵The examples and the basis of the discussion are taken from the third chapter of Paul Kiparsky's "Phonological Change."

The final conclusion reached in Kiparsky's thesis⁶ is that certain relic forms in Greek indicate that DV operated historically *after* CR and GL. If this conclusion is true, we can say that CR and GL operated right after Z2 (i.e., that no important historical changes affected tense stops between the operation of Z2 and of CR-GL). In any case CR and GL operated right after Z2 in Indic, since DV is a Greek rule.

But CR-GL is of the same form as Z2, which can be re-written as follows:

$$Z2. \quad [-\text{sonorant}] \rightarrow [-\text{tense}] / [-\overline{\text{voice}}]$$

Thus, Z2 can be formally related not only to general laxing (CG) in the history of the central group, but also to more restricted laxing (CR-GL) in the history of Greek and Indic. Cluster reduction and Grassmann's Law simply represent two more environments in which the laxing tendency, first expressed by Z2, appeared in Greek and Indic.

Even if Kiparsky is incorrect in saying that DV did not intervene between Indo-European Z2 and CR-GL in Greek, it seems plausible that an accurate theory of linguistic change could formally capture the similarity of CR-GL and Z2 as part of the same historical event; however, if Kiparsky is correct, the formalism needed in this case is the very simple bracket notation used for ordering rules in synchronic generative phonology.

Since the possibility outlined above is another way to tie in Z2, but not G1, to a known historical event, namely, the laxing laws in Greek and Indic, we have another reason to prefer the NIE analysis.

(5) IE suffixes begin only with the tense stops of NIE. (Note that even this generalization cannot be stated in the TIE system.) Thus, the following possible stop combinations occur at a suffix boundary:

TIE:	g	+	t	NIE:	k	+	th
	gh	+	t**		gh	+	th**
	k	+	t		kh	+	th
	g	+	dh		k	+	dh
	gh	+	dh		gh	+	dh
	k	+	dh		kh	+	dh

⁶*Ibid.*, p. 3-25.

(For simplicity, only the combinations of velars followed by dentals have been listed.) In IE, the first element of obstruent clusters assimilates in voicing to the second element, with the first element losing its tenseness, even in Greek and Indic, by the cluster reduction rule.

In Iranian and Indic, however, the output of the underlying double-starred combination is $g + dh$ ($g + d$ in Iranian, because of CG). Given this irregularity, usually known as Bartholomae's Law, we can state two things using the NIE analysis that are not statable in the traditional analysis. First, the Indic-Iranian rule of voicing assimilation states that *if one of the elements is voiced, the cluster is voiced*. Under the TIE analysis, however, $g + t$ becomes $k + t$. Second, TIE cannot explain how tenseness "crosses" onto the second element in $gh + t$ without an ad hoc rule. But if the tenseness is already there, as in NIE, there is no problem, once the voicing assimilation takes place. The nonvoiced aspirates of NIE that remain such (the unstarred *th*'s in the above chart) are deaspirated by Z2 without the use of an ad hoc rule. Thus, NIE is again preferable over TIE.

It might be well at this point to summarize the development of the various branches of IE from NIE by means of a chart, since the final sections, which deal with the exact form of Z1 and Z2 rather than with the systems of individual language groups, will demand a clear grasp of what has been proposed so far.

Indo-European:	ph	bh	p	
Voicing of p (Z1) in all branches except Germanic, Armenian, Hittite:	ph	bh	b	Relic areas: ph bh p
Laxing of voiceless stops (Z2) in all areas having undergone Z1:	p	bh	b	
Generalized laxing in the central group and in Hittite (except for non-intervocalic voiced Latin aspirates)	p	b	b	(Hittite: p b p)
Devoicing (DV) in Greek and in the remaining Latin aspirates:	p	ph(f)	b	

Greek *ph* and Indic *bh* further p ph-p b
 laxed by cluster reduction and p bh-b b
 Grassmann's Law:

Operation of G3 in Germanic: f v-b p
 Laxing of voiced stops in Ar- ph(h) b p
 menian, probably related to CG:

(6) One might suggest, as an argument against the NIE analysis and in favor of the TIE analysis, the alternation in Proto-Germanic between the infinitive and the past participle in a verb like "to save": *skapjan* versus *skaftas*. Traditionally, this alternation in Germanic between a stop and a continuant has been thought to be due to the independently motivated rule of voicing assimilation in IE. That is, the IE *skabjan* versus *skaptas* was due to the devoicing of an original *b* before *t*, and the normal operation of Grimm's Law gave the Proto-Germanic forms. (The *t* and *k* in *skaftas* are not aspirated because of a condition on G1 that will be discussed in the next section.)

The Germanic alternation seems to be a valid point in defense of TIE, yet an explanation is not lacking in the NIE framework either. On the one hand, the Modern English *kt* cluster is often pronounced *xt*, and we know that the Latin *k* was eventually weakened to *y* before *t* (*octo* → *ocho*, *huit*; *lactum* → *leche*, *lait*), most certainly by passing through the stage of *x*. On the other hand, the similar behavior of labials and velars is attested in many languages; this behavior is evidence for the feature *noncoronal* in consonants. For example, in Modern English, the only permissible final stop clusters are *pt* and *kt*; in many dialects, *y* in the triphthong *yuw* is retained just after labials and velars; and labials and velars do not occur after the diphthongs *au* and *oi* in final position.

Thus, it is not improbable that the original forms in IE were NIE *skapjan* and *skaptas* and that at least noncoronal stops became fricatives in Germanic before a following stop. Thus, in Germanic, *p* would have first become a voiceless bilabial fricative (phonetically) in *skaptas*; subsequently, when G3 operated to change *ph* to *f*, this bilabial fricative "fell together" with the new *f*.

The above is not meant as a refutation of the usefulness of the TIE analysis to explain this alternation, but rather as a

demonstration that the facts of the argument are not incompatible with the NIE position. They can be accounted for by postulating an extra but natural sound change in the history of Germanic.

(7) Consider next the four forms of Proto-Germanic given below:

skapjan (infinitive) – skaphtas (participle)
nasjan (infinitive) – nasithas (participle)

In the traditional analysis, this alternation has been explained by the fact that G1 was not completely general, but operated only after sonorants. In an NIE analysis, one must postulate a rule *within Germanic* to account for the *th*–*t* alternation, since the rules expressing Grimm's Law (Z1 and Z2) operate outside Germanic. This rule is of the form:

LAX. [-sonorant, -voice] → [-tense] / [-sonorant]___

At first, the necessity of incorporating this rule into a total NIE analysis might seem to be evidence for TIE, but closer examination does not bear this out. First, the context of the rule is nothing more than the complement of the context of G1 in the TIE analysis. Second, there is no reason why LAX cannot be regarded as a rule that applied to all of IE as a synchronic rule, before Z2 began the fragmentation into dialects. Indeed, a quick look at the formulation of Z2 shows that Z2 is a generalization of LAX, just as we have previously argued that CG is a generalization of Z2. Third, there is precedent for postulating a rule like LAX, since this same rule applies to voiceless stops in Modern English. Thus, LAX is a completely natural phonological rule whose presence *within* IE gives a basis for the operation of Z2, the rule that differentiates Germanic from the rest of IE. Also, although TIE describes the alternations given above, its explanation of them is no more convincing than that of NIE, and, inasmuch as NIE gives a synchronic IE basis for a diachronic rule, one might even consider the NIE analysis superior.

(8) In TIE, the only series of stops that occurs after an initial *s* is the *t*-(voiceless) series (I will refer to a series of stops in this section by its dental member), because initial *s* (or *z*) plus a voiced consonant is extremely rare in language.

In NIE, the correspondent to an initial TIE *st* combination is NIE *sth*. But if NIE is the correct view, should it not be

possible for an initial NIE *st* (corresponding to TIE *sd*) to occur? Indeed, it should be, but in any such combination Z1 must not have operated to yield *sd* (*zd* by voicing assimilation), since no initial *zd* clusters are attested in the non-Germanic branches of IE. Thus, we must assume that Z1 did not operate after word-initial *s*. After word-internal *s*, however, it did operate, because *zd* clusters are found in non-Germanic IE (*nizdos*, *ozdos*, etc.).

Let us suppose then that early IE had both initial *st* and *sth*, as well as internal *st* and *sth*. Operation of Z1 internally would give *zd* versus *sth*. Operation of LAX would give *zd* versus *st* internally, but would cause initial *st* and *sth* to fall together as *st*. Thus, the original IE root for the following cognates could begin with either NIE *sth* or NIE *st*.

Sanskrit: *stighnute*; Slavic: *stignq*; Greek: *steíkhō*;
Gothic: *steiga*.

Vedic: *stṛbhīḥ*; Greek: *astēr*; Cornish: *stere*n; Latin:
stella; Gothic: *stairno*; Armenian: *astt*.

These forms now allow us to explain an important irregularity in the TIE analysis. Recall the well-known constraints on morpheme structure in IE, by which root syllables cannot have the following three TIE forms:

$t (+cont)_0 dh$; $dh (+cont)_0 t$; $d (+cont)_0 d$

(The notation $(X)_0$ means zero or more elements *X*.) An exception to this constraint in the TIE analysis is the combination $st(+cont)_0 dh$, which can appear as a root. The first example given above is such a root, with final *gh* instead of *dh*. But, in the NIE analysis, we can derive this root from an original NIE $st(+cont)_0 gh$, rather than from NIE $sth(+cont)_0 gh$. The following constraints on morpheme structure exist in NIE terms:

$th (+cont)_0 dh$; $dh (+cont)_0 th$; $t (+cont)_0 t$

Therefore, no exception for roots with initial *st* need be made. Thus, the NIE analysis eliminates an asymmetry in the TIE analysis. There seems to be no similar natural extension of TIE that can account for this asymmetry in the way a careful statement of the NIE framework can.

(9) Finally, NIE allows us to view the development of the tense, voiceless aspirates in Indic and Greek in a new light. I am not denying, however, that credible theories about their origin have been advanced in terms of TIE (by the introduction of laryngeals, etc.). However, the presence of voiceless aspirates in NIE (the *ph*-series) suggests, as one possibility, an imperfect operation of LAX or Z2 in just those languages where some laxing took place, but in which all aspirated stops were not eliminated by CG. (By "imperfect operation," I mean the existence of a dialect in which the rule failed to operate, the dialect later dying out after contributing a number of "exceptions" to the previously completed historical change.)

If such imperfect operation of Z2 took place, it would account for Indic and Greek *ph*'s that corresponded to *p*'s in the central group and *ph*'s in Germanic. Meillet gives some examples of this type:⁷

Sanskrit: *phūt-karah*; Armenian: *phukh*; Greek: *phūsa*;
Lithuanian: *pūsti*.

Sanskrit: *kakhati* (from *khakhati*, by GL); Greek: *kakházo*
(from *khakhazo*, again by GL); Armenian: *xaxankh*;
Slavic: *xoxotŭ*; Germanic: *huoh*; Latin: *cachimus*
(*kakimus*).

Sanskrit: *skhālamī*; Armenian: *sxalim*; Latin: *scelus*.

The fact that the *ph*'s and *x*'s that occur in the Armenian (and the Slavic) examples do not correspond to the regular development of NIE *ph* and *kh* in those languages supports the notion that "imperfect operation" of Z2 should be interpreted as reintroduction of words from a dialect that did not undergo Z2 (or the other rules that affected Armenian and Slavic development of *ph* and *kh*).

Hypothesizing a similar imperfect operation of LAX—the forerunner of Z2 in the NIE framework—has even more interesting implications. According to this hypothesis, an Indic or Greek *ph* should correspond to a *p* in the central group, as before, but to a *p*, not a *ph*, in Germanic. Of course, such a correspondence should only occur after obstruents, which is the context for LAX. The reason for the predicted presence

⁷Meillet, *Introduction*, p. 90. Cf. also p. 84, second paragraph.

of *p* in Germanic is that the original NIE *ph*, which is supposedly left intact in the dialect exempt from LAX and reintroduced as *ph* later in Indic and Greek, is changed to *p* in all "regular" IE by LAX, and not just in the central group. In fact, there seem to be such correspondences of Indic *ph* with Germanic *p* (just the opposite of the usual correspondence of Germanic *ph* and Indic *p*). One common example is given by Meillet:⁸

Sanskrit: *sphurāti*; Armenian: *spiřkh*; Icelandic: *spori*.

Thus, if alternative theories on the origin of voiceless aspirates in Indic are unconvincing or incomplete, we have reason to look to the NIE formulation as an improvement over TIE.

(10) In this paper I have examined numerous arguments that favor reinterpreting Grimm's Law as having worked partly in reverse. That is, I have hypothesized that the original IE stop series were tense voiced (*bh*), tense voiceless (*ph*), and lax voiceless (*p*), rather than the traditional *bh*, *p*, and *b*, respectively. It has been shown how this view accords better with later developments of stops in the various Indo-European languages. I have also examined, in sections (6) and (7), some observations that might be taken as objections to the principal hypothesis and have shown that they do not seriously undermine it.

It is certainly possible that each of the arguments in this paper can be refuted or balanced with a counterargument in favor of the traditional view of the Indo-European stop system. Nonetheless, it is inadmissible to take this traditional view as the null hypothesis in discussing Indo-European, since it can be challenged by many arguments supporting a consistent alternative position. Any argument about more general questions of sound structure or sound change cannot unquestioningly be based on traditional assumptions about Indo-European consonant phonology. Rather, a new effort is needed to see whether Germanic or non-Germanic branches of Indo-European are representative of the most ancient state of that language.

⁸Ibid., p. 90.

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